## REMARKS

This paper is being provided in response to the Office Action mailed November 4, 2002, for the above-referenced application. In this response, Applicant has amended claims 1 and 10 to clarify that which Applicant considers to be the invention. Further, Applicants have amended the specification to correct an inadvertent omission as requested by the Examiner. Applicant respectfully submits that the amendments to the claims are supported by the originally-filed specification and that the amendments to the specification do not add new subject matter.

The objection to the drawings has been addressed herein according to the guidelines set forth in the Office Action. The paragraph in the specification beginning on page 11, line 8 has been amended to reference washers 7 and 8. Accordingly, Applicants respectfully request that this objection be reconsidered and withdrawn.

The rejection of claims 1-4, 6, 10 and 15-16 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 6,049,151 to Suzuki et al. (hereinafter "Suzuki") is hereby traversed and reconsideration is respectfully requested in view of the amendments to the claims contained herein.

Applicants' independent claim 1, as amended herein, recites an electromagnetic actuator. A stationary assembly is included that includes two coils disposed coaxially with each other inside a hollow stator yoke composed of a soft magnetic material. A movable assembly is included that includes a movable magnet unit and a movable yoke unit both disposed inside the coils with a very small clearance therefrom and both attached to a supporting shaft such that the

movable assembly is movable in the axial direction of the supporting shaft. The movable assembly travels in the axial direction by the interaction between a magnetic field generated by the movable magnet unit and a current passing through the coils. Claims 2-9 and 15-20 depend directly or indirectly on independent claim 1.

Applicants' independent claim 10, as amended herein, recites an electromagnetic actuator. A stationary assembly is included that includes a plurality of paired coils each of which is composed of two coils and which are disposed coaxially with each other inside a hollow stator yoke composed of a soft magnet material. A movable assembly is included in which movable units, each comprising a movable magnet unit and a movable yoke unit, of a plural number identical with that of the paired coils are axially disposed on a same axis inside the coils in such a manner as to be spaced apart from the stationary assembly by a very small distance. The movable assembly travels in the axial direction by the interaction between magnetic fields generated by the movable magnet unit and currents passing through the coils.

The Suzuki reference discloses a motor structure having an output shaft with a male screw part with a female screw part provided on a rotor rotated by electromagnetic interaction to move the output shaft in an axial direction. When a prescribed pulse driving voltage is applied to the lead wires of the coils, the rotor sleeve starts to rotate by the interaction between magnetic flux generated from the rotor magnets. The output shaft screwed to the inside of the rotor sleeve is also forced to rotate but then moves in the axial direction due to the screw structure design. (See Abstract, Figure 2, and col. 3, lines 34-60).

Applicants' independent claims, as amended herein, recite the feature that a movable assembly includes a movable magnet unit and a movable yoke unit...*both attached to a supporting shaft such that the movable assembly is movable in the axial direction of the supporting shaft.* The assembly travels in the axial direction by the interaction between a magnetic field generated by the movable magnet unit and a current passing through the coils. The actuator of the present invention has no rotor that is rotatable inside a stator yoke but has an assembly which is linearly movable in the axial direction of the supporting shaft. As shown in Figure 1, the supporting shaft (24) is fixed to the yoke units (22, 23) and the magnet unit (21) and these members move as a whole in the axial direction of the supporting shaft (24). (See page 10, lines 16-27).

Applicants respectfully submit that Suzuki does not teach or suggest at least this feature as claimed by Applicants. Specifically, Suzuki discloses a rotor sleeve (6) that is rotated inside a stator yoke so that the output shaft (1) engaging with the rotor sleeve (6) through inside screws is moved in its axial direction. (See col.3, lines 41-49). Suzuki's movable assembly structure (rotor sleeve (6)) contains no substantial member corresponding to the movable yoke unit of Applicants' claimed invention. In Suzuki, the *rotor sleeve and the movable magnet unit are rotated* and the output shaft is movable in the axial direction. In contrast, in the present invention, the supporting shaft is fixed to the yoke units and the magnet unit and the members move as a whole in the axial direction of the supporting shaft. Thus, the structure and movement of the claimed invention is markedly different from Suzuki regarding generation of an output force. Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn.

Further, with particular attention to claim 2, Applicants recite that the direction of the current passing through one of the two coils is opposite from the direction of the current passing through the other coil. Applicants respectfully submit that Suzuki makes no mention of the reversal of the direction of current flowing through two coils. (See Suzuki, col. 3, lines 58-60). It is to be noted that Applicants' claim 2 recites that the direction of current flowing in one of two coils is reversed with respect to the direction of current flowing through another coil, but it is not defined that the direction of current flowing in the two coils is reversed or changed if it is desired to reverse the direction of the movement of the movable assembly. Accordingly, Applicants respectfully request that the rejection of claim 2 be reconsidered and withdrawn.

The rejection of claims 5, 7-9 and 17-20 under 35 U.S.C. 103(a) as being unpatentable over Suzuki in view of U.S. Patent No. 4,868,432 to Frandsen (hereinafter "Frandsen") is hereby traversed and reconsideration is respectfully requested in view of the amendments to the claims contained herein.

The features of Applicants' independent claims 1 and 10 are discussed above. Claims 2-9 and 15-20 depend directly or indirectly on these independent claims.

The Frandsen reference discloses a linear actuator for reciprocating a read/write head mechanism relative to a magnetic disk storage system including a second, supplemental solenoid coil and associated magnet pole. The Office Action cites Frandsen as disclosing the dimensions

and arrangement of permanent magnets arranged oppositely-poled for the purpose of balancing the flux flow symmetrically and allowing the return flux to be put to work.

Applicants respectfully submit that Frandsen fails to overcome the above-noted deficiencies of Suzuki with respect to Applicants' independent claims. In addition, Frandsen discloses a magnetic circuit in a conventional actuator known as VCM. Applicants' invention intends to solve the problems associated with the conventional VCM. (See Applicants' page 1, line 14 to page 3, line 1). Frandsen's disclosure has no structural basis for a movable magnet unit and moveable yoke unit as claimed by Applicants. Furthermore, Frandsen's actuator could not be combined with Suzuki's actuator because the actuators in these two references are of distinctly different types so as to be arguably inoperable with one another. Applicants respectfully submit that neither Suzuki nor Frandsen, taken alone or in combination, teach or suggest at least the feature of a movable assembly including a movable magnet unit and a movable yoke unit...*both attached to a supporting shaft such that the movable assembly is movable in the axial direction of the supporting shaft.* Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn.

Based on the above, Applicants respectfully request that the Examiner reconsider and withdraw all outstanding rejections and objections. Favorable consideration and allowance are earnestly solicited. Should there be any questions after reviewing this paper, the Examiner is invited to contact the undersigned at 617-248-4038.

Respectfully submitted,
CHOATE, HALL & STEWART

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Donald W. Muirhead
Registration No. 33,978

Choate, Hall & Stewart
Exchange Place
53 State Street
Boston, MA 02109
Phone: (617) 248-5000
Fax: (617) 248-4000